BULLETIN NO. 14

1908

EXPERIMENT STATION

TUSKEGEE NORMAL & INDUSTRIAL INSTITUTE

TUSKEGEE INSTITUTE, ALA.

How To Make Cotton Growing Pay

BY

G. W. CARVER

Tuskegee Institute Steam Print

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The Tuskegee Agricultural Experiment Station

Bulletim No. 14 | *April, 1908*

HOW TO MAKE COTTON GROWING PAY

G. W. CARVER, M. S. Agr. Director

Two years of cotton experimentation have come and gone since the issue of Bulletin 7 of this station, on Cotton Growing on Sandy Upland Soils; in that bulletin we took the position that every acre in Alabama capable of growing cotton, could and should be made to produce a bale of cotton to the acre.

The bulletin further shows that the above position was correct as it not only produced a 500-pound bale but 20 pounds in excess.

The years of 1906 and 1907 were such trying ones, and the output of cotton so satisfactory that we feel that it will be of special interest to every farmer to know just how it was done. Since the same laws which govern the successful production of cotton apply with equal force to other field and garden crops, we call attention to the following things of importance:

PREPARATION OF THE SOIL

In this it is safe to say that fully two-thirds of our farmers fail, they fail first, because they do not turn (broadcast) their land in the fall just as soon as the the crop is off. Second, they do not plow deep enough.

ADVANTAGES

(1) Deep plowing (which should be from 8 to 9 inches) brings to the surface, plant food that the rain and other agencies have carried beyond the reach of the feeding roots of the average farm crop

(2) If the plowing is proprly done in the fall it puts the cotton stalks, leaves, grass and whatever other accumulations there may be on the surface of the ground underneath, where it will rapidly decay, and the nonavailable plant food becomes available, and the humus be in the very best possible condition, to perform its most important double duty as an absorbent of the soluble plant food and an improver of the soil's physical condition.

(3) Fall plowing destroys many insects, which deposit their eggs

in the stems of weeds, upon leaves, under clods, or just a few inches under the surface, by putting them deep down under the earth, where they drown out or smother. Those which nature intended should be buried deep into the earth, for protection are brought to the suface, where, many freeze, others become food for the birds, while still others perish by having their natural homes broken up; thus greatly reducing the number of injurious insects. The same can be said of the rusts, smuts, anthracnose, and many other spot diseases.

(4) Deep fall plowing increases the water-holding capacity of the soil, greatly reducing injurious washing, it also helps to mix the soil by quickly softening the more friable portions and allowing it to percolate into the cracks made by the plowing process.

(5) It permits the wind, water, air, sunlight, earthworms, bacteria, moulds, ferments and other plant, animal and mineral agencies to better perform their work of soil building.

THINGS TO BEAR IN MIND

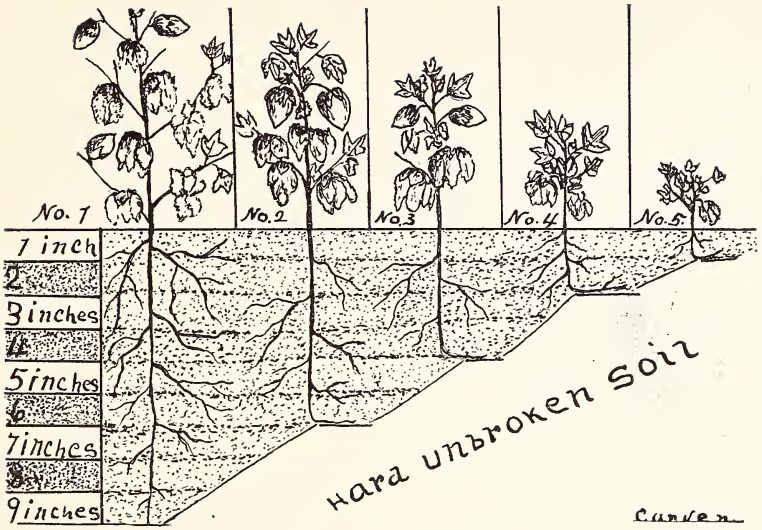
Since any extreme is more or less dangerous the following should be borne in mind:

(a) That most of Macon County soils are very thin, and have but little or no alluvial layer and therefore the farmers must begin with the subsoil, and make out of it an alluvial layer.

(b) That brick or pipe clay soils (such as much of our soils are) must not be broken or worked in any way when too wet, lest its productive power be injured for two or three years. All preparation or tillage should be done when the soil crumbles the easiest, and does not ball up into a sticky mass when pressed in the hand.

(c) That nine-inch plowing and upward is the end desired, but must be done gradually on our thinnest soils unless we have plenty of barnyard manure or its equivalent in vegetable matter, supplemented by the proper Commercial fertilizers.

(d) That it will pay you to plow this land, real shallow (3 or 4 inches), first after broadcasting a liberal coating of stable manure, leaves, muck, etc., upon it; plow this under four inches. Run over it several times with a disc harrow until thoroughly cut up. Spread on another layer of manure as thick as the first, turn four inches deeper, which will make eight inches in all, harrow in the same way. Put the commercial fertilizers in the drill, as usual. If this has been thoroughly done a good crop may be ex-



CUT 1

pected. This soil can be deepened to advantage a little more next year.

Not only the soil is affected by deep and shallow preparation but the growth and fruiting power of the plant as well. (See cut 1, which is drawn from an experiment conducted on our own experiment farm.) Some typical wornout soil was selected and divided off into five plots; No. 1 was plowed and thoroughly pulverized by repeated plowings and harrowings until the soil was fine and mellow to a depth of nine inches. Nos. 2, 3, 4 and 5 respectively, in the same way, to the depths as indicated, viz.: six inches, four inches, two inches and one inch.

No fertilizer of any kind was used on these plots, the object being to study or demonstrate the exact effect of deep and shallow preparation of the land upon the cotton plant.

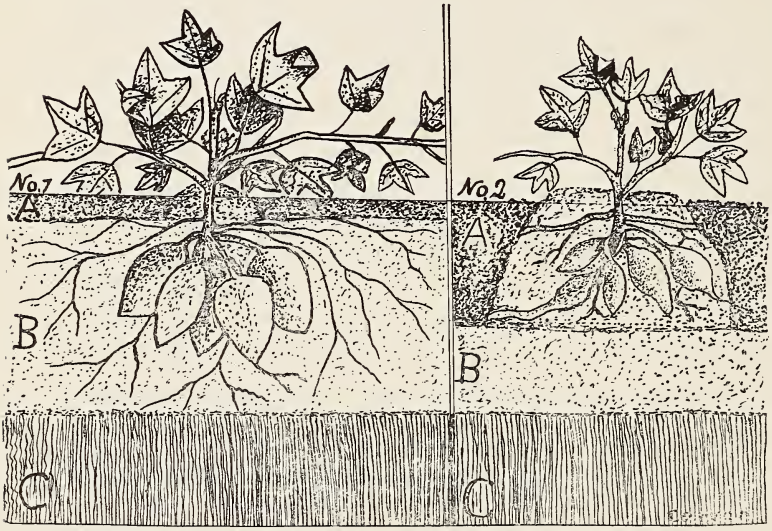
The cut needs but little explanation, stalk one has splendid root growth, the tap root extending through the nine inches of mellow soil and is abundantly supplied with vigorous laterals, or feeders, this stalk matured twelve bolls.

In No. 2 the tap root strikes the hard ground and turns at six inches, the laterals are noticeably fewer in number, and this stalk only matured six bolls.

No. 3 speaks for itself, the tap root struck hard ground, and turned at four inches, but few laterals are noticeable. Four bolls represented the crop.

The tap root of No. 4 struck hard ground at two inches, and made a desperate struggle to live, but the odds were against it. It could only mature two bolls.

No comments are needed on No. 5. It did well to mature its one little boll.



CUT 2

CORRECT CULTIVATION	INCORRECT CULTIVATION
(A) Two inches of fine soil.	(A) Six inches cultivation, ground left loose and open.
(B) Seven inches of loose, mellow soil.	(B) Three additional inches of loose earth which will dry out very fast.
(C) Subsoil full of water.	(C) Subsoil with its cappillary water, much of which will soon be exhausted.

After the correct preparation of the soil, the selection of good seed, the proper fertilization and planting, comes tillage which is none the less important as (Cut 2) plainly shows. This cut was made from an experiment conducted at the same time of (No. 1) in our experiment field; however one was conducted on cotton, but we felt that the sweet potato plot illustrated the point better,

as the roots could be more plainly seen, therefore we used it instead.

In this cut we show a hill of potatoes from plots one and two. No. 1 shows a mulch of very fine soil produced by two-inch cultivation which is so essential in our light sandy soils which are naturally very thirsty. Note the feeding roots are not disturbed and extend down nine inches to the water-bearing subsoil. Here we see a vigorous growth of vine, splendid root power and a good yeild of fine large potatoes.

In plot two we did as many farmers do, cultivated deep, went down five and six inches, cutting the feeding roots and greatly reducing the yield of potatoes.

Aside from the above this was significant, that despite the very dry season, plot 1 grew and flourished throughout the entire season and did not seem to suffer for want of water, while No. 2 suffered greatly, losing most of its leaves.

Exactly the same was true of the cotton plots, the dust mulch preserved the water, undisturbed the feeding roots, and the plants held their leaves and continued to grow, bloom, and set bolls until frost. Neither leaves nor bolls were seriously affected by the Anthracnose, rust or other spot diseases.

Another important point for the farmer to keep in mind is the fact that all plant foods in the soil are rendered nonavailable or worthless to the plant unless there is sufficient water in the soil to properly dissolve and distribute them. Hence in the thirsty soils it is doubly necessary that the cultivation be done in such a manner as to save the water. (See cut 2.)

Cotton is a typical, taprooted plant, made to go deep into the soil, for both water and plant food, but the many decades of soil skimming, e. g., poor seed selection and bad cultivation have dwarfed both root and top and produced a plant that has lost much of its original characteristics. It has been so lowered in vitality that the roots, stems, leaves and bolls are all subject to a large number of destructive diseases.

Aside from the tap root going deep into the ground, of well prepared soil, it throws out numerous laterals, often four and five feet in length, the largest of which as a rule are just below the surface of the ground; hence the wisdom of shallow cultivation.

THE WEATHER CONDITIONS OF 1906–1907

In order that we may fully appreciate the very trying conditions under which these two crops were made, I beg to submit the

1906

JAN.		FEB.		MARCH		APRIL		MAY		JUNE		JULY		AUG.		SEPT.		OCT.		NOV.	
Rainy Days	Amount of Rain in Inches	Rainy Days	Amount of Rain in Inches	Rainy Days	Amount of Rain in inches	Rainy Days	Amount of Rain in Inches	Rainy Days	Amount of Rain in Inches	Rainy Days	Amount of Rain in Inches	Rainy Days	Amount of Rain in Inches	Rainy Days	Amount of Rain in Inches	Rainy Days	Amount of Rain in Inches	Rainy Days	Amount of Rain in Inches	Rainy Days	Amount of Rain in Inches
3	1 70	8	1.37	3	.55	9	.30	4	93	9	.41	3	80	3	.25	1	03	1	45	14	1.15
8	.02	21	.13	7	1 82	13	.97	6	1 90	12	.63	7	.50	4	.20	5	.76	3	.38	17	42
20	1 65	24	.18	14	.33	..	....	21	05	14	45	11	.03	5	02	7	04	18	2 37	18	.90
21	2 05	27	.23	15	28	.	....	25	.46	16	.33	12	.90	13	1 70	8	1 20	..	....	..	....
26	37	..	....	18	53	..	...	..	....	19	.19	13	95	14	.10	9	03	..	...	..	....
27	05	..	....	19	1 00	..	....	..	....	21	.27	14	.20	25	08	18	.53	..	....	..	....
..	....	.	....	28	1 85	..	....	..	....	24	.73	15	2 13	..	....	19	53	..	....	..	....
..	....	..	....	29	.24	..	....	..	....	..	..	16	.50	..	....	21	83	..	....	..	....
..	....	..	...	30	.32	..	....	..	....	.	....	17	.08	..	....	25	1 10	..	...	..	....
..	....	..	....	..	....	..	....	.	....	..	....	18	20	..	....	26	02	..	....	..	...
..	....	..	....	..	....	..	....	..	....	..	....	22	.53	..	....	29	.50	..	....	..	....
..	....	..	....	..	....	..	....	..	....	..	....	24	.41	..	....	..	....	..	....	..	....
..	....	..	....	..	....	..	....	..	....	..	....	25	.40	..	....	.	....	..	....	..	....
..	....	..	....	..	....	..	....	..	....	..	....	26	.20	..	....	..	....	..	....	..	....
..	....	..	....	..	....	..	....	..	....	..	....	28	.70	..	....	.	....	..	....	.	....
6	5.84	4	1 91	9	6 82	2	1 27	4	3 34	7	3 01	15	8 53	6	2 35	11	5 57	3	3 20	3	2 52

1907

JAN.		FEB.		MARCH		APRIL		MAY		JUNE		JULY		AUG.		SEPT.		OCT.		NOV.	
Rainy Days	Amount of Rain in Inches	Rainy Days	Amount of Rain in Inches	Rainy Days	Amount of Rain in Inches	Rainy Days	Amount of Rain in Inches	Rainy Days	Amount of Rain in Inches	Rainy Days	Amount of Rain in Inches	Rainy Days	Amount of Rain in Inches	Rainy Days	Amount of Rain in Inches	Rainy Days	Amount of Rain in Inches	Rainy Days	Amount of Rain in Inches	Rainy Days	Amount of Rain in Inches
26	.37	1	.45	1	.86	5	1 05	3	30	11	10	9	.10	11	39	3	20	8	61	2	58
30	.60	2	12	31	.36	12	89	7	12	14	02	11	36	23	.20	13	24	27	27	10	95
31	.34	4	1 21	..	....	17	1.00	8	84	24	32	12	.56	24	20	22	70	..	....	12	.30
..	....	19	02	..	....	26	.61	11	76	..	....	13	.43	..	....	27	.15	..	....	17	.44
..	....	25	.58	..	....	22	2 05	15	1 75	..	....	19	40	..	....	28	66	..	....	20	1 28
..	....	26	.25	..	....	28	.67	23	38	..	....	20	.07	..	....	..	....	..	....	22	3 22
..	....	28	.80	..	....	..	....	27	87	..	....	25	36	..	....	..	....	..	....	23	.24
..	....	..	....	..	....	..	....	30	.18	..	....	26	2.00	..	....	..	....	..	....	27	1.56
..	....	..	....	..	....	..	....	..	....	..	....	28	10	..	....	..	....	..	....	..	....
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..	....	..	....	..	....	..	....	..	....	..	....	30	.49	..	....	..	....	..	....	..	....
3	1.31	7	3 43	2	1.22	6	6 27	8	5 20	3	44	11	5 49	3	.79	5	1 95	2	88	8	9 67

weather conditions for the months of January, February, March April, May, June, July, August, September and October.

The Meteorological data speaks for itself. It can be seen at a glance that the spring, summer, and fall of 1906 were entirely too wet for cotton. All through the month of January but little plowing could be done. Only eight totally clear days occurred, during this month.

Excessive rains fell on the 3rd, 20th, and 21st, with .37 of an inch of snow on the 26th. February was an ideal month for farm operations.

March was not so favorable, the later part was very wet and cold, on the 21st the mercury fell to 26 degrees, the peach crop was killed and much damage done to early spring gardens.

April was a reasonably good month, but a little dry for light, sandy soils.

May, the first month, was only fair for cropping, being a little too cool for cotton to thrive well. Twice during the month the mercury fell as low as 43 degrees, on the 11th and 12th, while on the first and second, it was 92 and 91 degrees respectively, and on the 30th and 31st it was 91 degrees. High temperatures occurred more or less throughout the month with now and then a sudden drop, which is very detrimental to cotton.

June was a very favorable month for cotton, no excessive rains, but seven good showers distributed pretty evenly throughout the month. No day or night showed a temperature below 60 degrees or above 99 degrees.

July was entirely too wet for cotton; during the month it rained 15 days, and 8 53 inches of water fell. It also rained eight days in succession. Heavy wind storms occurred on the 15th and 23rd. During this time the crops suffered greatly.

August was a very favorable month for the opening of cotton but it shed the top crop and rusted badly on account of the bad weather conditions of July.

September was very wet, there were 15 days that it actually rained or drizzled, and not a single totally clear day in the month. An almost hurricane gale blew on the 27th, 28th and 29th, both seed and lint were greatly damaged, a large quantity was blown out onto the ground and the seed grew, much that remained in the bolls kept so continuously wet that the seed grew. Nearly every cotton grower of any size lost heavily.

October cleared up and proved to be a very good month for completing the harvest and the fall seeding of grain.

November was a very favorable month for all kinds of farm operations.

The month of January, 1907 was noticeable from the fact that only two days and nights fell to the freezing point, and but few to the frost line. The maximum temperature ranged from 50, 60, 70 and 81 degrees, much plowing was done.

February was equally mild and favorable for farm operations, much plowing and gardening was done.

March had scarcely a single day that fell below 70 degrees and often went up to 90 degrees. Not a single day or night fell to the frost line. Corn was planted and grew off nicely, considerable cotton was planted.

April was generally cold and wet, several heavy frosts fell and killed both cotton and fruit, corn was also injured badly. The heavy rains impacted the soil so that cotton could not come up well.

May continued wet and unfavorable for cotton, much had to be plowed up and planted over, seed were exceedingly hard to get, and high in price. Plants weak, even the little seedings were attacked with sore shin, black root and the leaf-spot diseases.

June was a good growing month, but cotton was yet small, and many farmers were replanting, plowing up and planting over.

Some fields were abandoned entirely owing to the difficulty with which seed could be se·ured and the continuously wet conditions of the low lands.

July, in this month the rains were local and heavy, too much for low lands, and retarded the uplands somewhat.

August was excessively hot and dry, causing cotton to shed and rust badly.

September and October were dry and favorable for harvesting the crop.

November, was rather wet, cold and disagreeable, but the cotton crop, which, as a rule, was light had all been harvested.

Notwithstanding these trying conditions, the Station has been able to make bales of cotton as follows, from six acres of land:

In 1906 the total yield of lint was 2,123 pounds or four 500–pounds bales, plus a hundred and twenty-three pounds.

1907 crop yielded 2,043 pounds or four 500– pound bales, plus forty-three pounds.

One is able to appreciate the value of this yield when he recalls the fact that less than ten years ago this piece of land would not successfully grow even a satisfactory crop of cow peas; 250 pounds of potash, phosphate and nitrate of soda were used per acre, as follows:

100 pounds of acid phosphate and the same amount of muriate of potash, plus 25 pounds of nitrate of soda, were thoroughly mixed and put into the drill, followed by a small scooter which served as a mixer, the seed were then planted as usual.

After chopping and just before "squares" begun to form, the remaining 25 pounds of nitrate of soda was applied as a top dressing, just after a light shower of rain, great care being exercised to get the small amount evenly distributed over the acre.

Much of the success of last year's crop is due to the persistent plowing up, planting over and replanting; this was done up to the third of July (and that planted so late made a fair crop)

From year to year the following facts became more and more apparent:

(1) that the proper preparation of the land; (2) the proper fertilization; 3) the proper selection of seed; (4) and the proper cultivation of the crop, are all fundamentally essential in the production of a good crop of cotton. It further emphasizes the fact that our light, sandy, wornout soils can be reclaimed and made to yield paying crops of cotton.